$$x_n = \frac{1}{2\pi j} \oint_C X(z)\, z^{n-1}\, dz$$

$$\frac{X(z)}{z} = \sum_{k=1}^{n} \frac{c_i}{z-p_i}$$

$$\frac{\mathcal{Z}[a^k]}{z} = \frac{\cancel{z}\;1}{z-a}$$

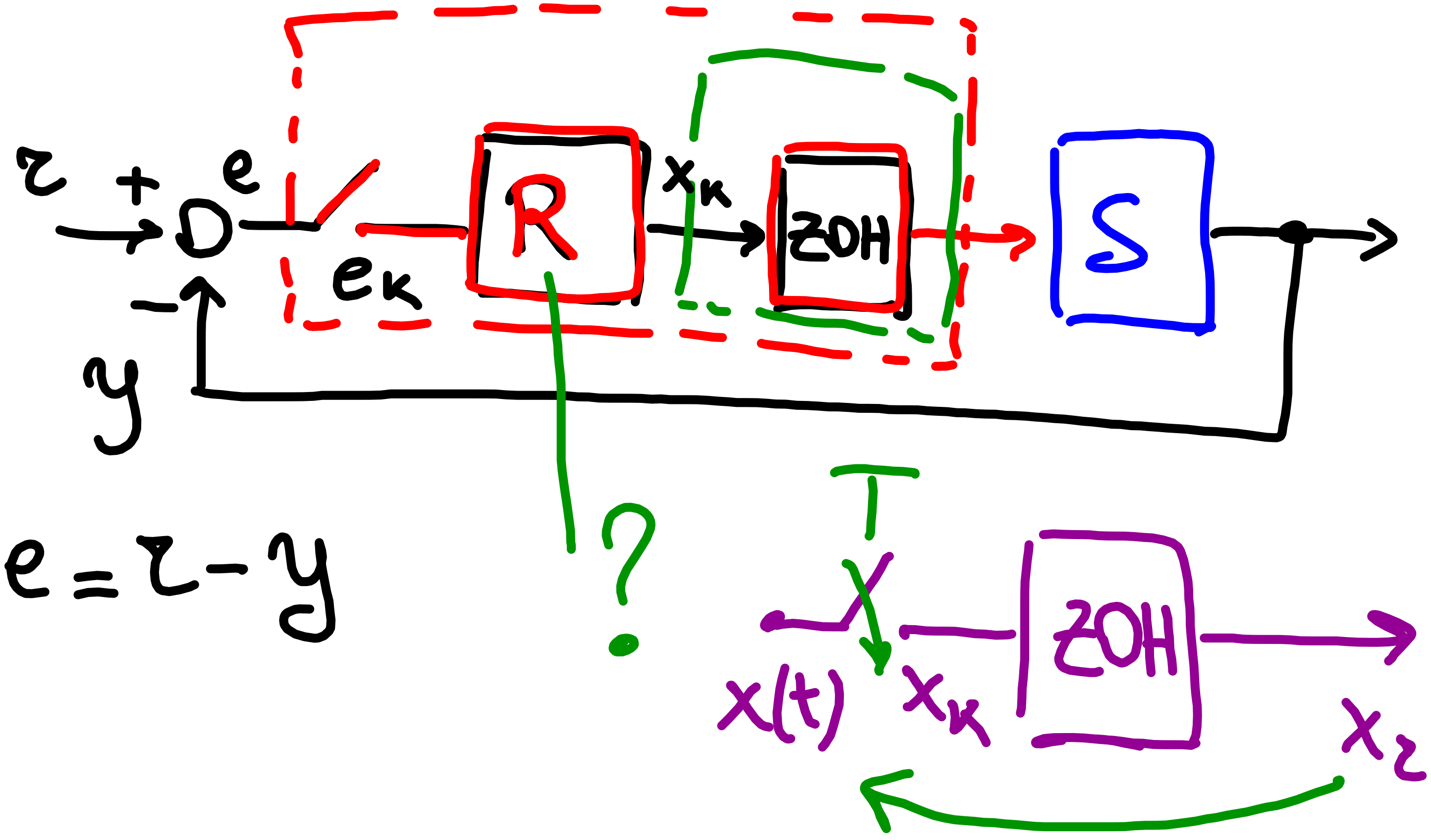
$$\frac{c_i}{z-p_i}$$

$$\downarrow$$

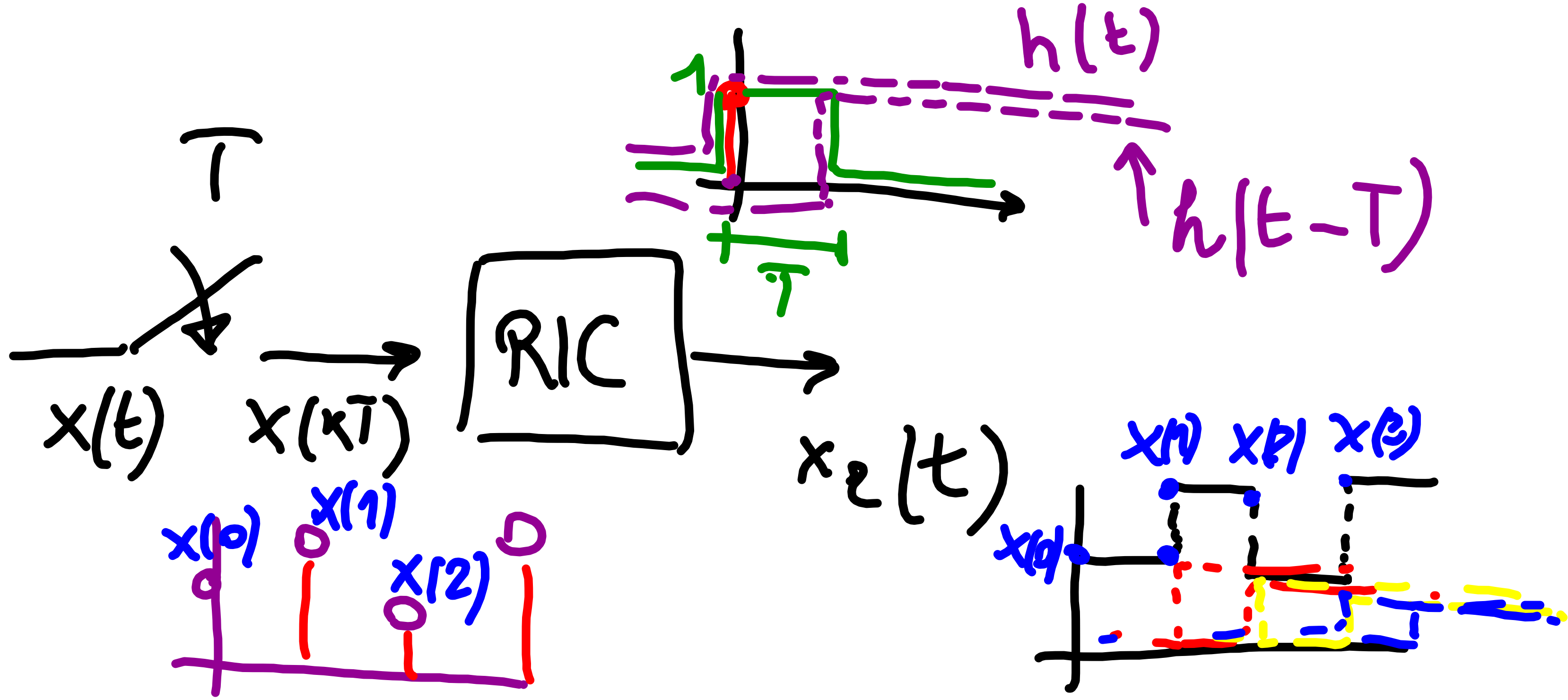
$$c_i\, p_i^{k}$$

$$y(t) = \sum_{k=1}^{n} c_i \, e^{-p_i t}$$

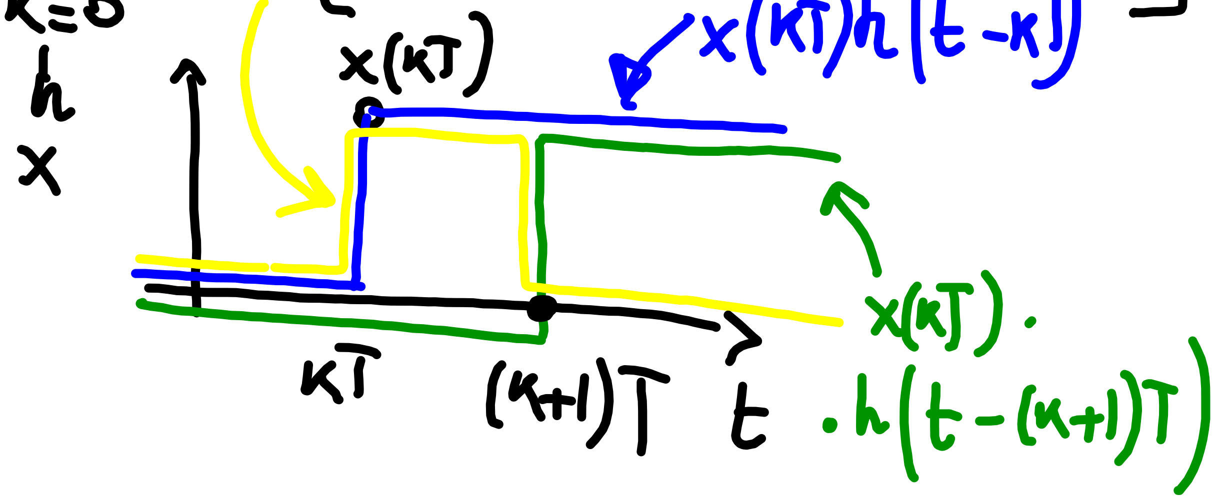
$$c_i \, e^{-t/\tau_i}$$



$$e = r - y$$


h(t)
1
T
h(t-T)
T
x(t)
x(kT)
RIC
x₂(t)
x(0)
x(1)
x(2)
x(0)
x(1)
x(2)
x(3)

$$x_2(t) = \sum_{k=0}^{+\infty} x(kT)\left[h(t-kT) - h(t-(k+1)T)\right]$$



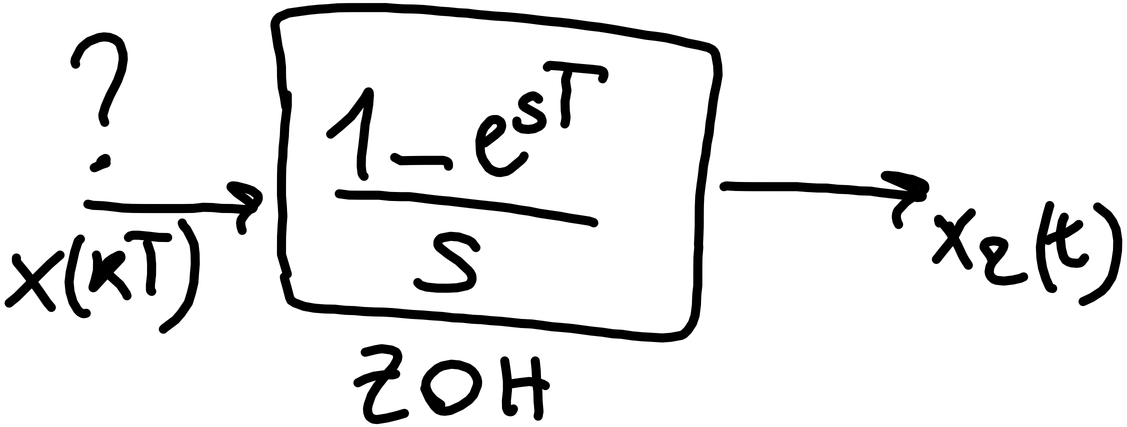
$$x_2(t) = \sum_{k=0}^{+\infty} x(kT)\left[h(t-kT) - h(t-(k+1)T)\right]$$

$$X_2(s) = \int^{+\infty} \underbrace{\sum_{k=0}^{+\infty} x(kT)}\ \underbrace{\left[h(t-kT) - h(t-(k+1)T)\right]} \cdot e^{-st}\,dt$$

$$X_2(s) = \sum_{k=0}^{+\infty} x(kT)\left[\frac{1}{s}e^{-kTs} - \frac{1}{s}e^{-(k+1)Ts}\right]$$

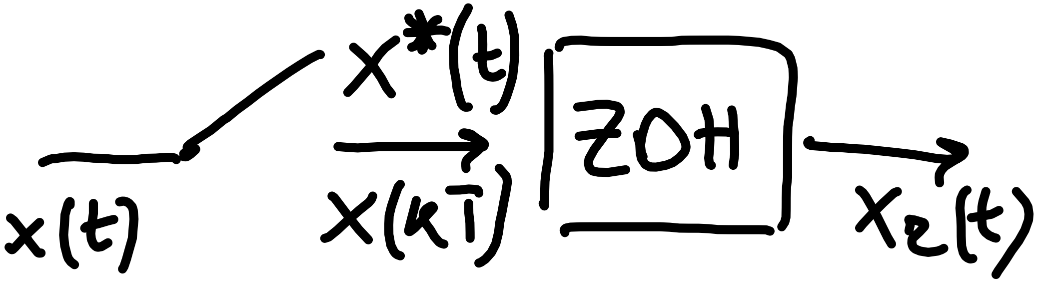
$$= \sum_{k=0}^{+\infty} x(kT)\, e^{-kTs} \underbrace{\left[\frac{1 - e^{-Ts}}{s} \right]}_{H_2(s)}$$

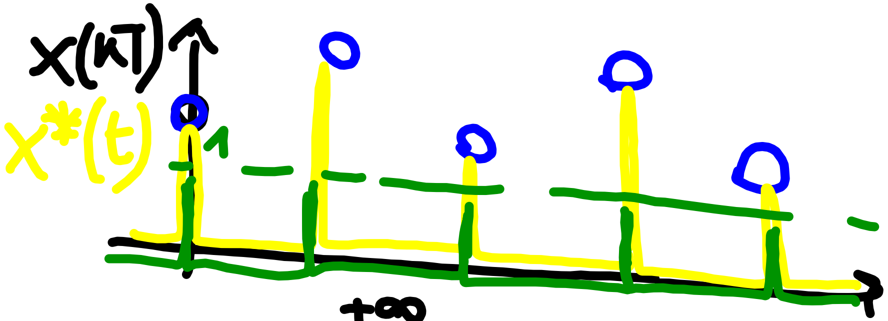
$$X_2(s) = H_2(s)$$



$$X_2(s) = H_2(s) \cdot \ ?$$

$$X_2(s) = \boxed{\sum_{k=0}^{+\infty} x(kT)\, e^{-kTs}} \left[\frac{1-e^{-sT}}{s}\right]$$





$$x^*(t) = \begin{cases} x(kT) & t = nT \\ 0 & \text{altrove} \end{cases}$$

$$x^*(t) = \sum_{k=0}^{+\infty} x(kT)\,\delta(t-kT) = x(t) \cdot \delta_T(t)$$

$$x^*(t) \longrightarrow \boxed{\text{ZOH}} \longrightarrow x_e(t)$$

$$X^*(s) \qquad\qquad\qquad X_e(s)$$

$$\mathcal{L}\left[x^*(t)\right] = \int_0^{+\infty} \sum_{k=0}^{+\infty} x(kT)\,\delta(t-kT)\, e^{-st}\, dt$$

$$= \sum_{k=0}^{+\infty} x(kT)\, e^{-kTs} = X^*(s)$$

$$X^*(s) = \sum_{k=0}^{+\infty} x(kT)\, \underbrace{e^{-kTs}}$$

$$Z[x(kT)] = X(z) = \sum_{k=0}^{+\infty} x(kT)\, z^{-k}$$

$$\boxed{z = e^{sT}}$$

$$Z[x(kT)] = X(z) \overset{z=e^{sT}}{\Longleftrightarrow} X^*(s) = \mathcal{L}\left[x(t) \cdot \delta_T(t)\right]$$

TC $X^*(s) \equiv X(z)$ TD

$e^{j\theta} = \cos\theta + j\sin\theta$ $\qquad e^{sT} = z$

$s, z \in \mathbb{C}$

$s = \sigma + j\omega$

$$e^{sT} = e^{\sigma T} \cdot \boxed{e^{j\omega T}}$$

$$e^{j\omega T} = e^{j(\omega + 2\pi)T}$$

S $\mathcal{L}$ $e^{sT} = z$ $\mathcal{Z}$ Z

$e^{\sigma T}$

$e^{j(\omega \pm 2\pi)T}$